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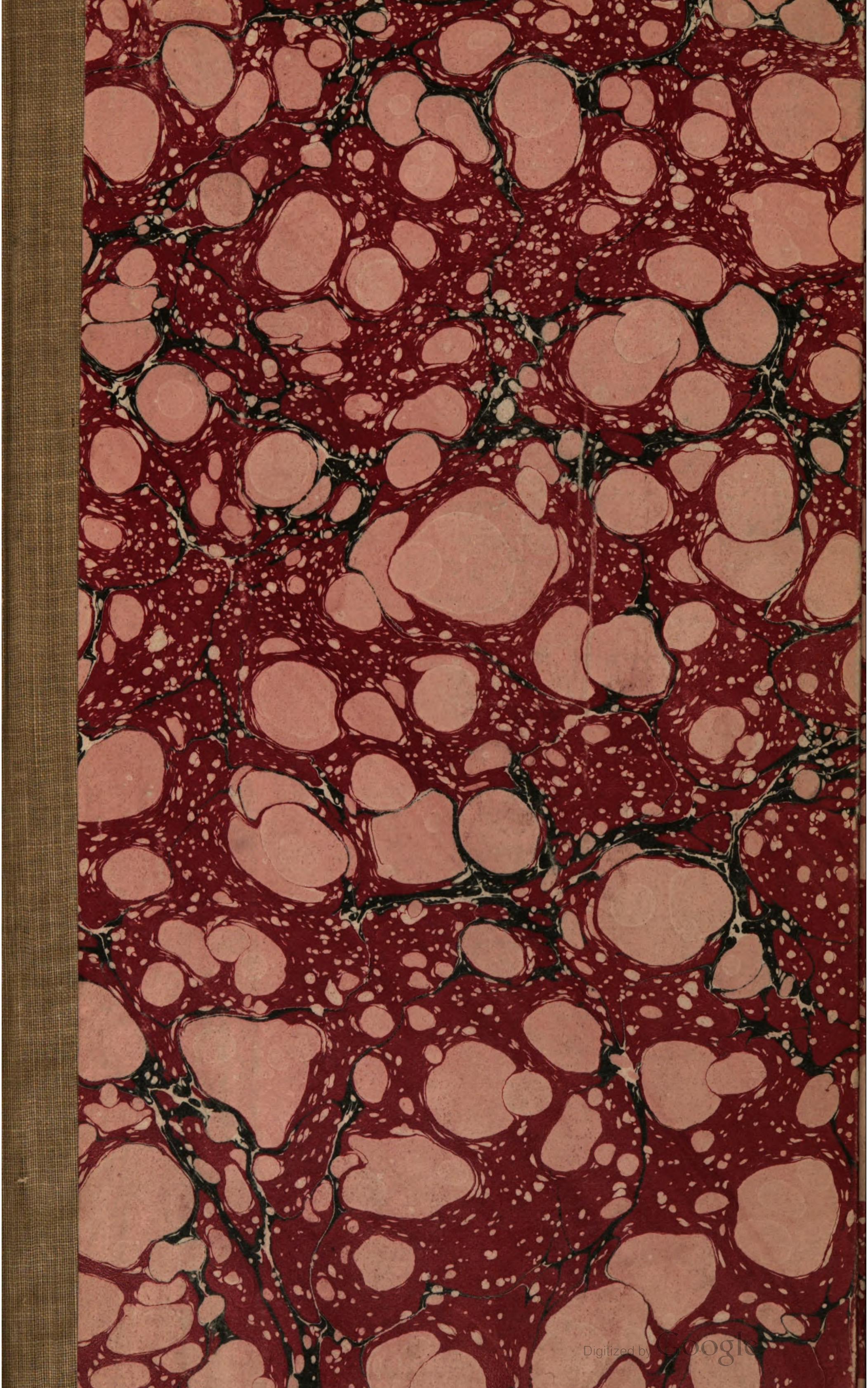

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1.

ADDRESS

BEFORE THE

ST. LOUIS ACADEMY OF SCIENCE,

AT ITS

ANNUAL MEETING FOR 1877,

BY THE PRESIDENT,

CHARLES V. RILEY.

ST. LOUIS, MO.
THE R. P. STUDLEY CO., PRINTERS, 221 N. MAIN ST.
1877.

Address before the St. Louis Academy of Science, at its Annual Meeting for 1877, by the President, Charles V. Riley.

GENTLEMEN AND FELLOW-MEMBERS OF THE ACADEMY:—In accordance with a long-established custom, in retiring from the position with which you honored me a year ago, I take advantage of the occasion to cast a summary glance at the more important achievements that have marked the past twelve months in our field of mutual labor. In surveying this field from a general or international standpoint, one is overwhelmed with a sense of its vastness; and where, in almost every special department, one or more good-sized volumes are annually published to chronicle the titles or to give the merest abstracts of papers published, and the briefest digests of work accomplished, it is manifestly impossible, in a brief address, to give any adequate idea of the world's progress in science during a single year—even were any one man competent to do so.

Science, at one time, belonged to the few — the learned. She was paraded on such high stilts, clothed in such uncommon garb, that the gulf intervening between her votaries and the masses precluded all affection or appreciation for her by the latter. To the tendency of the one class to break the cold, stiff crust of technicality which environed them, and to the increased intelligence of the other, must in great measure be attributed the extraordinary advancement of science of late years, and its increasing popularization. She to-day belongs, not to the few, but to the multitude; and merely to chronicle her progress has become an art. The collector in Nature's treasure-store, though thirsting for all knowledge the mind is capable of, and loth to slight any specimen whatsoever that may cross his path, yet, knowing the shortness of individual human life, passes by the majority of the objects which he meets with, and confines his attention to those which more particularly belong to the department which he has made a specialty of, and which he consequently best understands. Let me in the same way pass over the great multitude of interesting subjects that confront the chronicler of a year's progress in science, and confine myself to a few of the more conspicuous events, and more particularly in

American science and in paths most trodden by our own members, and, hence, most familiar to us.

PHYSICS.

A. M. Mayer has continued his researches in acoustics, determining the conditions under which one sound may obliterate another.

C. A. Young, of Hanover, N. H., has devised a method by which the spectra of higher orders (even to the eighth or tenth) produced by gratings, can be used for spectroscopic work. These are to be preferred, as their dispersion is greater, and lines which appear single in those of lower orders are seen double in the eighth or tenth spectrum. Ordinarily these spectra overlap, and Young separates them by refracting them with a prism in a direction at right angles to the direction of the dispersion by the grating. With this contrivance he has just demonstrated the displacement of lines in the solar spectrum due to solar rotation, thus proving the applicability of Doppler's principle of light—a theory which the researches of Van der Willigen and Secchi had caused astronomers to doubt.

A. H. Rowland, of John Hopkins University, has made important studies in the distribution of magnetism in bar magnets. He reaches the conclusion that hardening is more useful in short-bar magnets than in needles, and that boring a hole in the centre of the magnet is, in general, hurtful. J. Trowbridge, of Harvard, demonstrates experimentally that by distributing the fine wire of an induction coil upon two straight electro-magnets (instead of one), whose poles are provided with armatures consisting of bundles of thin, soft iron plates, the strength of the spark is increased 400 per cent. when large condensers are used.

A. S. Kimball, of the Worcester (Mass.) Institute of Industrial Science, has investigated "Sliding Friction on an Inclined Plane," and finds that the co-efficient of friction is a function of the velocity when the inclination of the plane is constant; that, with the same velocity, it increases with the inclination.

Among our fellow-members, Prof. F. E. Nipher has devised a lecture galvanometer, for lantern projection, which can be used in showing the presence of thermo and induction currents, and can also be used as a differential galvanometer. He has also shown the unequal distribution of errors in numbers written from memory, and has devised a method of measuring the strength of memory, an investigation in which he is yet engaged. He has also continued his investigations on the laws of muscular exertion; and has devised new and curious experiments on binocular vision.

ARCHÆOLOGY.

Much interesting work in this field has been done during the year by the Davenport (Iowa) Academy of Science, No. 1, vol. 1, of whose *Transactions* is largely given to the subject, and are most creditable. Mr. F. W. Putnam has completed the work left unfinished by the late Jeffries Wyman, on the "Fresh-Water Shell Heaps of the St. John's River, Florida." Our Academy has published the reports of observations and discoveries made by Prof. Gage, respecting his examinations of mounds and graves in Illinois, Mississippi, and Missouri, and also of those made by Mr. Conant, near New Madrid, Mo., of remains of an ancient Indian town, and the opening of mounds in which were found skeletons and pottery.

Prof. Potter and Dr. G. J. Engelmann, from the committee appointed to examine mounds, have had surveys made of several fortified villages in Southeast Missouri. Mounds have been opened, and skulls and pottery obtained, the former characteristic of the mound-builder type. Graves have been opened on the Illinois bluffs in St. Clair County, where skulls of the type of the modern Indian were found. Some mounds examined in the Okaw bottom yielded skeletons unaccompanied by pottery or weapons, while stone graves and other mounds in the same vicinity inclosed fragments of bones and pottery.

Mounds on the bluffs and in the bottom in the vicinity of the large Monk's Mound, opened by Dr. F. C. A. Richardson, contained some skeletons. Messrs. Hilgard and Patrick, of Belleville, Illinois, have made a careful and most valuable survey of Monk's Mound, and an interesting discovery of burnt and broken human bones was made by Mr. Hilgard in some of the stone graves opened by him on the Illinois bluffs. A number of the large series of mounds in the Arcadia Valley, Mo., were opened, and nothing found; so also mounds on the Missouri River were opened without result. Mr. Howland, of Buffalo, N. Y., made a most valuable discovery of horn and copper in a mound near Alton.

The Academy has appropriated, in all, $120.31 to defray the expenses o the committee, and most of the specimens obtained are in charge of Prof. Potter, at Washington University, for want of room and cases in our present quarters. Next to the publication of our Transactions and care of our library, whatever funds we may have to spare cannot be more profitably used than in prosecuting this Archæological work.

The interest created by the Archæological work done by the committee has resulted in the formation of an Archæological Section of the Academy, which organized on the 10th inst., and elected W. B. Potter, *Chairman;* F. F. Hilder, *Secretary*, and G. Hambach, *Curator*.

Division of labor is most desirable where the laborers are many and the field of labor is large. Where, as in our own case, however, the laborers are few, there is strength in union, and I question the wisdom of the separate section, because it withdraws just so much from the interest and value of the meetings of the main body, and all the sectional work could be done by a committee. The American Association formed an Archæological section in 1875, but the experience of 1876 proved the course unwise. There were not enough papers to maintain continued interest in the section, and those interested in maintaining it were kept from attending the general Section B.

ZOÖLOGY.

Many of the most interesting contributions in this department have been made through Hayden's Bulletins of the U. S. Geological and Geographical Survey of the Territories. Mr. J. A. Allen has continued his interesting papers on the "Geographical Variation in Birds and Mammals"; and indeed the various laborers in this field of Zoölogy have been so active that I must forego all mention of work in the different departments, and confine my remarks to the work in my own specialty more particularly. The study of the Arthropoda is less popular than that of the higher animals, but not less important. The Insecta alone in species outnumber all other animals, and a glance at the *Zoölogical Record*, published in London, England, is sufficient to show that the devotees of Entomology equal in number those of all other branches of Zoölogy, and that the literature of the subject is proportionally great.

Among the important contributions to Systematic Entomology, Le Conte's long-looked for *Rhyncophora of America N. of Mexico* holds high rank, and is a most admirable and philosophical treatise of a difficult group of beetles, which the author is led to believe are the oldest geologically, and, consequently, the most synthetic of present Coleoptera. Packard's *Monograph of the Geometric Moths* is a classical and admirable review of an extensive family of moths. Osten Sacken's *Prodrome of the Tabanidæ* of the United States, and his papers on Syrphidæ, are also noteworthy. The Entomological Club of the American Association for the Advancement of Science was very largely attended, and certain much-needed rules for guidance in nomenclature discussed and partly adopted. A vast number of Hübnerian generic terms, ignored by almost unanimous consent for the best part of a century, have of late years been adopted by some of our lepidopterists, and made to usurp the place of those which had been long accepted and were familiar. It has come to such a pass that a paper by an author who adopts the innovations is unintelligible even to the specialist. Few but those who proposed the changes have adopted them, and the large majority of working lepidopterists believe that there is not sufficient reason for flooding the science with such a mass of new terms. Two factions have thus grown up, and it is greatly to be desired that, by the adoption of rules for guidance, harmonious views and harmonious work may result.

The collections made by Capt. Fielden, of the British Arctic Expedition, add some interesting and unexpected facts to our knowledge of the distribution of insects upon the globe. Frail butterflies and moths, belonging to families and genera common with us, were taken in Discovery Bay in 81° 42′ N. latitude, and some even a degree farther north; while a bumble-bee and an Ichneumon-fly in *Hymenoptera*, and various mosquitos (*Culicidæ*) and black-flies (*Similium*) in *Diptera* that were also collected, show that honey-producers, parasitic species, and animal tormentors, exist in those high latitudes.

Considerable progress has been made in Economic Entomology.

The Colorado potato-beetle has attracted much attention in the Eastern States, and has abounded to that extent along the Atlantic coast, as not only to destroy all potatoes, but to prove a positive nuisance to persons. I lay before you a little pamphlet entitled *Potato Pests*, which largely treats of this insect, and was published in order to meet the demands made for the information in my earlier reports, which are no longer to be had.

I also lay before you a colored placard published by the German Government, to be used on all vessels plying between the United States and Germany, and which is a literal carrying out of my recommendations for preventing the introduction of the pest into Europe. The Commissioners of Customs in England have also published a similar order directing the officers of the out-door department of the service to look for and destroy any beetle answering a description which accompanies the order.

The Grape Phylloxera has continued to interest our grape-growers, especially those of California, and to vitally concern the people of France. The remedy still most practicable and most relied on is the grafting of the susceptible European vine on to the resisting American varieties, as recommended by me, and the demand for cuttings of some of our varieties has not fallen far short of the 14,000,000 sent over in 1875-6. The issue of the impregnated egg from the root-inhabiting type of this insect has been proved to be the agamic gall-producing type, and the specific identity of the two thus still more strongly and absolutely confirmed. There has been, for some years past, no doubt on this point in the minds of all investigators who had given the subject most careful study; but the opposite view was sustained and given a show of support by some very insufficient experiments made by the entomologist to our Department of Agriculture.

Some of the researches in Economic Entomology in Missouri have been laid, in outline, before the Academy, and others will appear in my official report. I shall not detain you, therefore, with any account of my own work. But there is one subject that cannot well be passed over; it is the

LOCUST SCOURGE.

For us, the locust problem just now transcends all others in economic entomology. It will be remembered, that, in opposition to contrary opinion widely circulated, I expressed my belief, a year ago, that in Missouri, Kansas, and Nebraska, first, there would not hatch as many locusts in the spring as would naturally hatch in ordinary seasons from indigenous species; second, that, compared with other parts of the country, those States ravaged by locusts in the spring and early summer of 1875 would enjoy the greater immunity, during the same season of 1876, not only from locust injuries, but from the injuries of most other noxious insects; that, in short, the people of the ravaged section had reason to be hopeful rather than gloomy; that they certainly would not suffer in any general way from locust injuries in the early season; and that the only way in which they could suffer from the migrating pest was by fresh swarms, later in the year, from the far Northwest.

Like the other opinions as to the future doings of this insect which I had on previous occasions expressed, this last was fully warranted by subsequent events, and the States mentioned have seldom enjoyed such immunity from insect depredations as in the spring and summer of 1876. Later in the year, however, the Rocky Mountain locust overran a large part of the western country, and, while in most instances they came too late to seriously affect maturing crops, they have laid eggs over large parts of

Minnesota, Nebraska, Kansas, and Colorado, and in more restricted portions of Iowa, Missouri, Texas, and Arkansas. Throughout the region named, injury, more or less serious, may be expected next spring. Should nine-tenths of the eggs be destroyed, there will yet hatch enough young insects to devour everything green, if no steps be taken to prevent the injury.

The winter has so far been favorable to the preservation of the eggs, which, with few exceptions, are yet sound; and while much alternately thawing and freezing weather between now and spring may destroy the large bulk of these eggs, such a favorable result will not do to rely on. Our farmers should expect the worst, and be prepared for it. "Forewarned, forearmed." Indeed, I am glad to say that they are very generally anticipating and preparing, where two years ago they were comparatively indifferent. They are profiting by the experience of 1874-5, and by what has, of late years, been written upon the subject. This is more particularly the case in Kansas, Nebraska, and Iowa,—and, I regret to say, less so in Missouri; for, in some of our counties that are threatened, there is no organization, and little preparation, to meet the enemy next spring. In our own State the injury will be confined, as it always has been, and, I believe, ever will be, to the western counties. The middle western counties, which most suffered in 1875, i.e. the portion of the State in which the winged insects reached farther east in 1874, and laid most eggs, will not suffer next spring. Such are the counties of Platte, Clay, Jackson, Lafayette, Cass, Johnson, Bates, Henry, Pettis, and Benton. In these counties the farmers have little or nothing to fear, except as they receive a few straggling and comparatively harmless bevies of the winged locusts in June and July from the neighboring country.

THE COUNTIES THAT WILL SUFFER

are—1st, Atchison and Holt, and the western half of Nodaway and Andrew, in the extreme northwest corner: 2nd, McDonald, Barry, Jasper, Lawrence, Barton, Dade, Cedar, Vernon, more particularly in the southwest half; Polk, in the northwest third; Hickory, in the southwest third; and St. Clair, in scattering places.

The locusts came into all these counties last fall, very generally ate off the fall wheat, and filled the ground, near its surface, with their eggs, in most parts quite thickly; and in all of them we may expect more or less injury next spring from the young locusts.

With few exceptions the wheat was killed, and the ground will have to be resown in the spring. Having, in my official reports, treated fully of the means to be adopted to prevent the injury, I will simply state that they are sufficient, with concert of action, to enable the farmer to protect his crops from the unfledged insects. Yet a State bounty law for the collection and destruction of the eggs and young insects would greatly assist, and I would earnestly urge our Legislature to enact some such law as I have suggested on page 138 of my last report.

Against the winged hordes, as they sweep down from the northwest, the farmer is powerless, and it is the manifest duty of Congress to make some effort to palliate an evil which is national in its character. My views that the destructive swarms that sweep down upon our fertile valley have their origin in the Rocky Mountain region of the northwest, are well known to the members of the Academy. They have been very generally accepted as correct, and Dr. Packard, editor of the *American Naturalist*, in an article of the present month's issue of that journal, though confessing himself at first skeptical as to the correctness of those views, indorses them since his visit to Kansas and Colorado in 1875.

The insect is not indigenous to Missouri and many of the other Western States that it occasionally devastates, and there is much yet to learn of its native habitat and breeding-places. There is not only a possibility, but a strong probability, that, by having the proper investigations made, we may be able to prevent its incursions into the more fertile country. As I have elsewhere remarked, "The fact that the agriculture of the United States is of equal importance with all other interests of the country combined, is so often asserted and admitted that it needs no enforcing. This industry not only feeds our own 40,000,000 mouths, but supplies the staff of life to millions in foreign lands. Surely, then, it is most important to study and investigate those causes which affect it injuriously and arrest its development, among which injurious insects play such an active part.

"When, as in the past few years, the prosperity of nearly the whole country between the Mississippi and the Rocky Mountains is jeopardized, and the whole Nation suffers most sensibly from locust ravages, National measures should be taken to investigate the causes, and to endeavor to prevent the recurrence of such disasters in the future. Congress owes it to the farmers of the West that some effort be made to relieve them, as far as it is in human power to do so, of this insect burden, which is doing more than any other to crush them.

"In the present case, it is not merely the question of saving to the Nation, in future, such vast sums of money as this insect has taken from the producers of some of the Western States—amounting during the past few years to nearly a hundred million dollars; it is a question affecting the welfare of whole commonwealths on this side of the Mississippi, and the ultimate settlement of a vast tract of country extending from the base of the Rocky Mountains eastward, to which settlement the ravages of the locust in question offer the most serious obstacle."

A CONFERENCE OF THE GOVERNORS

of Missouri, Illinois, Iowa, Kansas, Nebraska, Minnesota, and Dakota, was held at Omaha last October, to consider this all-important locust problem, and I lay a copy of the official report before you. The conference memorialized Congress on the subject, and asked for a Commission of five, to consist of three entomologists and two practical men of experience with the locusts, to be appointed by the Chief of the Geological and Geographical Survey of the Territories, and approved by the Secretary of the Interior, the duty of which Commission it shall be to examine into the history, nature and habits of the insects, and to suggest means of destroying them, and remedies against their ravages; and it asks, for this purpose, that the sum of $25,000 be added to that part of the sundry civil appropriation bill providing for said survey of the Territories in order to pay the expenses and salaries of such Commission.

The National Agricultural Congress, at its meeting in Philadelphia last September, unanimously prayed for similar action, and many prominent agricultural and horticultural societies in the West have done likewise. I have for three years pleaded for some such national legislation, and let us hope that the demands being made will not go unheeded. The time is most opportune, for a Commission created this winter would have an opportunity, that may not occur again for years, of studying and experimenting on the young insects from Texas on the South and Missouri on the East, in addition to their investigations in the extreme Northwest.

BOTANY.

The study of plants having always been a favorite one with naturalists, the rough botanical work of naming and classifying them has, in Europe, been pretty well accomplished, there being scarcely any new forms to be discovered, except, perhaps, among the Cryptogamia. Botanical study has there, as a consequence, legitimately turned to the structure and functions of the different parts, and our European friends begin to look down, perhaps a little too proudly, on systematic work, which is not less essential than the other, and must always precede this last. As Americans we have enough to do yet to master the mass of material, and, while not neglecting anatomy and physiology, must needs study the forms, their development and affinities. Thus the *Flora of California*, the first part of which has just been published in the report of the California Geological Survey, gives a most important and long-needed account of the vegetation of the Pacific coast, so different in many respects from that of the eastern part of the continent. The Gamopetalæ are by Gray, and the Polypetalæ by Watson and Brewer. Up to this time we have had no connected history of the Flora of the whole United States. The classical Flora of Torrey and Gray, published nearly forty years ago, but never completed, remained far behind the progress of the science. Later work has been scattered in numerous isolated journals or other publications—often difficult of access. Botanists, therefore, hail with delight the announcement that Prof. Gray has now passing through the press his *Synopsis of the Flora of N. A.* It is eagerly looked for both at home and abroad. Many other laborers in this field have, during the year, contributed their share, and the papers presented by Mr. Meehan to the Philadelphia Academy of Science are particularly noteworthy. Mr. Meehan is conservative, and does excellent work. An ardent observer, he seems to delight in the discovery of exceptional facts that seem opposed to the general observations and conclusions of some of the leading workers in botany, and from this tendency not unfrequently attaches too much importance to such exceptional facts, but even misconstrues the real facts. In recent papers on the "Fertilization of Flowers by Insect Agency," he has insisted on the scarcity of insects in the Rocky Mountains, and the non-scarcity of seed in the colored flowering plants there. In truth, however, as I know from my own experience and that of others, no region is richer in pollinigerous and pollinizing species,—the Hymenoptera, and the Mordellidæ and the Meloidæ in Coleoptera, being exceedingly abundant, and the Diptera also abounding, especially the more hirsute Tachinidæ, that are particularly well adapted to carry pollen. Our honored member, Dr. Engelmann, has given us an exhaustive paper on the interesting Agaves, naming one of the most elegant species after our esteemed fellow-citizen, Mr. Henry Shaw; also a preliminary study of the difficult American Oaks, which is a most valuable and highly appreciated contribution to the classification of the genus.

Few who have not done similar work appreciate the amount of labor and close application in the closet which such a philosophical resumé implies, of a subject that has before been treated of at so many hands; and it is interesting to note that in this, as in all other monographic work where large experience is brought to bear, the tendency is to greatly reduce the number of previously accepted species, and thus add weight to the assumption of evolutionists, that species have a conventional rather than a real existence in nature.

In cryptogamic Botany, the articles by Prof. W. G. Farlow in the Bulletin of the Bussey Institution are noteworthy. The work of the microscopist to the department of Agriculture in this line has often been open to criticism; and, after the fungus caricatures and unimpressive dissertations that have on some occasions appeared in the pages of the reports from said Department, it is refreshing to read Prof. Farlow's papers on Black Knot, Grapevine Mildew, and other destructive fungi.

EVOLUTION.

The visit of Prof. Huxley to America must be looked upon as an event in the progress of evolution in this country—not that he laid before us anything new, but because he brought in succinct form, and so conspicuously before the public, some of the best arguments in favor of the doctrine. All great truths that oppose long established popular belief must needs belong to the few when nascent. Struggling to overcome the embargo which prejudice and ignorance always set in their path, they at last win acceptance from the mass of thinking men, who by that time wonder how there could ever have been serious objection to the new light. The doctrine of evolution has very nearly reached this second stage; and it must be gratifying to those who from the first accepted Darwin's conclusions, to be able to witness the revolution that has taken place on the subject in the minds of naturalists, and is fast taking place in the minds of the people. Seven years ago, in discussing the theory of natural selection as exemplified in two of our common butterflies, I stated my belief that the idea of the development of species by a conceivable process would in time not only supersede the old idea of special creation, with naturalists—that it would come to be recognized as a law; but that the liberal-minded theologian would come to revere the names of men like Darwin, who help to a higher conception of creation, "instead of anathematizing them, and charging to their doctrines those atheistic tendencies which in times past have been vainly charged to those of so many other great, clear-thinking, discovering minds." Late events have justified the belief. Future events will, I believe, justify it further, since, in my humble opinion, the idea of evolution is founded on fact, and, like a gem freed from the deposits which for ages have hidden its lustre, will shine all the brighter as the obstacles which surround it are removed by the light of truth.

Professor Gray has done good service in bringing together his various essays on Darwinism under the title of *Darwiniana*. Always interesting and enjoyable, Professor Gray tells heavily against the popular but erroneous idea that Darwinism is atheistic, by showing how ably it may be supported by "one who is scientifically and in his own fashion a Darwinian, philosophically a convinced theist, and religiously an acceptor of the 'creed commonly called the Nicene' as the exponent of Christian faith." In treating of the considerations which have led so many working naturalists to accept the derivative hypothesis, Prof. Gray uses the following language, which I strongly commend to those who find fault with Darwinians for not discussing or attempting to explain the remote origin of life: "They leave to polemical speculators the fruitless discussion of the question whether all species came from one or two, or more; they are trying to grasp the thing by the near, not by the farther end, and to ascertain, first of all, whether it is probable or provable that present species are descendants of former ones which were like them, but less and less like them the farther back we go."

GEOGRAPHICAL.

Explorations in many unexplored or little known parts of the world have been carried on, and the different Government expeditions in our own country have been particularly active. The return of the British Arctic Expedition created an unusual interest, and the scheme which Capt. Howgate, of the Signal Service, has lately advocated for successfully reaching the North Pole, by establishing temporary colonies north of lat. 81° N., near the shore of Lady Franklin's Bay, is well worthy the consideration of Congress.

METEOROLOGICAL.

The tornado in Warren County, Iowa, was among the most serious and disastrous that have been known in this part of the country, and that in St. Charles County, in our own State, was quite severe; but all our meteorological excesses dwindle into insignificance as one reads of the terrible nature of the late hurricane in the East Indies, which engulfed whole islands and towns, and sent hundreds of thousands of human beings to untimely death.

The meteor that passed over this region, from S.W. Kansas to N.W. Pennsylvania, on the evening of the 21st of last December, was one of the most brilliant ever witnessed here.

The work of the Signal Service continues to grow in popular favor and in usefulness, and the appearance of the volume just published by the Smithsonian Institution, entitled "Tables of the Distribution and Variation of the Atmospheric Temperature in the United States," marks an important event in Meteorology.

The Meteorological Congress, assembled at Vienna in 1873, submitted a proposition urging the establishment of stations for taking one simultaneous observation daily, of such character as to be suitable for the preparation of synoptic charts. Immediate organization was begun, and by July 1, 1875, when the first International map was issued from the Signal Office at Washington, reports were received from 268 stations, so distributed as to carry the observations all around the Northern hemisphere on land. Since that time the number of stations has been increased to 397, and now, with the view of further extending the system, General Myer has succeeded in getting the coöperation of the Navy Department, which has issued orders to commanders of all vessels to have one observation made daily on all ships, wherever situated, at 7:35 A.M., Washington mean time. It is hoped that the similar coöperation of all nations will be received.

OUR TRANSACTIONS AND PROCEEDINGS.

At the annual meeting for 1873 we resolved from that time forth to publish the Journal of Proceedings in installments of sixteen pages, and that it be the Recording Secretary's duty to prepare an official report of said proceedings for the press, the pages to be numbered in Roman numerals. This was accompanied by other resolutions providing for the speedy publication of papers accepted for the Transactions. The object sought by the resolution was to keep the work of the Academy before the world, and to encourage contributors by giving them printed copies of their contributions as soon as possible. The different signatures are to be kept by the publishers until such time as enough have accumulated to make a number. There is indeed much to be gained in this gradual method of publishing, over the former custom of waiting till sufficient material for a number had accumulated; and it is to be regretted that we have not issued one or two signatures of Proceedings since our last number was distributed. The custom of publishing an official abstract of our Proceedings in the *Western*, to some extent renders less urgent the strict carrying out of said resolutions, and the editors of the magazine deserve our sincere thanks for their courtesy; nevertheless, the reports therein published are necessarily condensed, and I would respectfully call our Recording Secretary's attention to the resolutions. Many of the subjects discussed at our meetings are interesting to the public, but lose much by the time our Transactions are distributed, and we should endeavor to let shine what little light we may possess, and not to be too exclusive. We should also endeavor to send out at least one number of our Transactions each year, however small the number may be, or even if composed principally of proceedings. We owe it to the large number of home and foreign societies which so liberally exchange with us.

OUR LIBRARY.

Our library increases rapidly with the annual addition of our exchanges, and forms to-day the only general collection of scientific works in the city, and the best west of the Alleghanies. For two or three years very little work has been done upon it, except as the Academy has appropriated money therefor. Our Librarian has been at the same time Librarian of the Public School Library, and his care, or rather non-care, of our exchanges has neither deserved nor received much praise. While, however, we may regret that Mr. Bailey has, from cause whatsoever, taken little interest in the Academy or its library of late, it must not be forgotten that he has excuse: 1st. In the stated lack of shelf room; 2d. In our agreement with the Public School Board, one clause of which reads as follows: "All books in the form of collections or libraries which are deposited by said parties in the building aforesaid to be placed under the care of the managers of the Public School Library, to be kept together and used as a reference library exclusively; members of the Public School Library to have the privilege of using said collections; members of the organizations owning said collections or libraries to pay the same fees that annual subscribers to the Public School Library pay (not to exceed three dollars per annum), provided that said members use said collections; said libraries and collections to be classified and catalogued by parties owning the same, or at least under their direction."

BUILDING—MUSEUM.

Soon after we were burned out of house and home, in May, 1869, the Board of Public Schools most generously offered us quarters, and we have regularly met ever since in this Polytechnic building, and had our library and the remnant of our museum herein deposited. Our meetings were first held in the northeast corner room of the third floor, then in the southeast corner of the same, and, finally, in this session room. An agreement was entered into between the Academy and the Board in December, 1868, and as, by some strange oversight, no copy thereof was transferred to the minutes, there are few of our members who fully understand the terms of agreement. From the original document, which I have been at some pains to procure, and which I lay before the Academy for preservation in its archives, it appears that neither party to the contract can dissolve it until notice has been given at least six months prior by the party intending such dissolution to the other party of the contract. In this connection, it is proper to recall that nearly five years ago, or in February, 1872, Dr. J. B. Johnson encouraged us to believe that a gift of $1,200 or $1,500 might be made to the Society; whereupon he was appointed a committee of one to act on the subject. As we have never had a definite report, I would suggest the dismissal of the committee. Subsequently, by deed dated June 8, 1872, the late James H. Lucas donated to the Historical Society and the Academy a lot of ground for building purposes on the south side of Locust street, in block 515. Unfortunately the deed was conditional, and unless built upon within five years after conveyance of the deed, the lot reverts to the donor. This, added to the fact that two societies are equally to share the lot, may perhaps explain why the gift has hitherto remained unavailable. Soon after the donation there were held frequent meetings of a joint committee from the two societies, appointed to get subscriptions and obtain plans and estimates for a building. By direction of this committee, two plans for a building have been made—one at an estimated cost of from $60,000 to $80,000, the other at from $40,000 to $50,000. At a joint meeting of the two societies, December 2, 1872, a separate Finance Committee was appointed, consisting of S. B. Johnson, Silas Bent, and Albert Todd, on the part of the Historical Society, and Dr. McPheeters, Mr. Lynch, and Enno Sander, on the part of the Academy. A stock subscription book has been opened and $1,200 subscribed; beyond this, little if anything has resulted from the labors of this committee, and I would suggest the appointment of a fresh one. This question of a building is most vital to the success of our Academy. By the terms of the deed, the Lucas lot is subject to forfeiture by the 8th of June next, unless by that time the erection of a building for the uses of the societies shall be begun in good faith, and completed "without unreasonable delay," and it is for us to determine whether to forfeit our claim, or make a vigorous effort to secure it for all future.

Nothing is so essential to our prosperity as a permanent abode, where we can have our meetings in the midst of our specimens and surrounded by our library. Such surroundings have a stimulating influence, and the museum increases the interest of papers or discussions by furnishing illustrations. The early prosperity of the society was in no small measure due to the commodious rooms granted by Col. O'Fallon, and we must never expect greatly increased prosperity until we settle in quarters of our own. I care not how plain and unpretending a building we commence with. Let it only be recognized as the St. Louis Academy of Science, and we shall receive a support from the citizens of St. Louis such as we can hardly hope for under existing circumstances. Under the protection of the Board of Public Schools our library and cabinet are lost on the public as a distinctive feature of the Academy, and they are, and have been for some time, so cramped that there is no possible room for expansion. Go to New York, Buffalo, Albany, Philadelphia, Boston, Cambridge, Baltimore, Chicago, San Francisco, and the museum is one of the city institutions. Instructive as well as entertaining, it is one of the first things sought by the visitor from abroad. Many minor towns have their museums; and yet St. Louis, the fourth city of the Union, still lacks one. Are we not ourselves largely to blame? I cannot believe that the wealthy men of this city are so lacking in public spirit and liberality that they would, if properly appealed to, refuse to rear a structure that would be a credit to us and to them. The Academy of Science is one of the institutions of St. Louis, and in proportion as it is honored before the world, in that proportion does the city profit. "Cast thy bread upon the waters, for thou shalt find it after many days." The liberal support of an academy of science, the proper encouragement of scientific research, are among the things that not only redound to the honor and credit of a community, but which may be, and almost always are, productive of increased material welfare and prosperity.

The comforts and conveniences of present civilized existence are almost entirely due to achievements in the domain of science, applied to human requirements; and the field of discovery is still open before us. When the State of New York supports a State Museum of Natural History at Albany, and the City of New York appropriates $500,000 for a museum building; when Philadelphia subscribes a still greater sum for a like purpose,—surely St. Louis ought not to beg long for $40,000! St. Louis, by her central position, would naturally attract and receive the bulk of the very rich treasures constantly gathered from the bosom of the Mississippi Valley, did she offer inducement to collectors in the way of a substantial and safe museum building. She centres a region unsurpassed in the wealth of its archæological, ethnological, geological, mineralogical, and natural history specimens; and the records of the past fascinating history of this valley, which rightfully belong to us, have been and are now fast passing from our reach, and enriching Eastern and foreign museums. For reasons sufficiently apparent, many of the most successful collectors of museum material remain single, or, if married, are intestate; if the collector have a family, the children generally inherit different tastes. In either case the tendency on the part of such collector is to will his collection to some institution that will duly care for and appreciate it. Without a building we cannot profit by this tendency. But the need of such a building is urgent and obvious, and I am glad that, by recent resolution, the next meeting of the Academy is set apart for consideration of this subject. I shall not anticipate that discussion by giving you in advance my views as to the best ways and means of obtaining one; but let me express the hope that something feasible and practical will result from it.

WHAT HAVE WE ACCOMPLISHED?

Many of our citizens, and some who are good paying members of the Academy, but who do not attend its meetings, occasionally ask, "What have we done, or are doing?" The cry of *cui bono?* is always heard in this practical age. Our Society, for reasons already stated, bounded into prosperity soon after its organization. The war and the fire checked that prosperity, and we lost a museum that was fairly representative of the general Zoölogy and Botany of this region, and contained many valuable specimens in Comparative Anatomy, Ethnology, Palæontology, Geology, and Mineralogy. Since the fire we have been creeping along slowly but progressively, and, notwithstanding there is room for improvement, we have

JUST CAUSE FOR CONGRATULATION.

When I go back in mind to my early connection with the Academy, and remember the trials of 1869, when, in mourning the loss of workers like Shumard and Baumgarten, in addition to that of our museum, scarce a half dozen of us gathered around our ever faithful Recording Secretary, the late Spencer Smith; when our Associate Members numbered not fifty, and we were in debt and unable to publish our Proceedings; when I recall those critical days, and then consider what we have done in the past few years, I feel that we have cause for congratulation. We have during the year published No. 3 of vol. iii. of the Transactions, and, as our Corresponding Secretary's report shows, there is an increasing demand for the different numbers of our publications, 385 numbers having been disposed of by exchange and 35 numbers sold. This number contains, with many fine illustrations, articles on the following subjects:—Iron Manufacture in Missouri, Schmidt; Remarks on Canker-worms and Description of a new Genus in Phælænidæ, Riley; Notes on the Natural History of the Grape Phylloxera, Riley; On a New Form of Lecture Galvanometer, Nipher; Notes on Agave, Engelmann; Notes on the Yucca Borer, Riley; The Rocky Mountain Locust and the Season of 1875, Broadhead; The Meteor of December 27, 1875, Broadhead; Archæology in Missouri, Conant; Age of our Porphyries, Broadhead; Oaks of the United States, Engelmann.

Among the minor communications of the year the following may be mentioned:—Meteorology of 1875, Engelmann; American Antiquities, Holmes; Porphyritic Rocks of Southeast Missouri, Broadhead; Mounds of New Madrid, Conant; Meteorology of March, Engelmann; On Distribution of Errrors in Numbers written from Memory, Nipher; Oviposition of *Leucania unipuncta*, Riley; Man and the Elephant in Nebraska, Holmes; Grape and Oak Fungi, Engelmann; Periodical Cicada, Riley; Entomological Notes, Riley; Centennial Insects, Riley; On Lignites, Potter; Binocular Vision, Nipher; Geographical Range of Species, Riley; Sago Palm, Engelmann; On the most Favorable Manner of applying Muscular Work, Nipher.

During the year we have elected 19 Associate and 6 Corresponding Members, and we now have 2 Life and 109 Associate Members. Death has taken 3 members from us, viz., Mr. Pomeroy, Mr. A. Steitz, and Dr. M. M. Pallen, one of the founders of the Academy. We have paid out $120.31 for archæological work, $94.62 for cataloguing and other work on the library, and $525.08 for publishing our Transactions. There is, nevertheless, a balance in the treasury of $159.71.

THE JETTIES—CAPT. EADS.

Our Academy may also feel justly proud of the magnificent engineering achievements of one who has twice honored the chair which I now resign, and whose fame will never fade so long as our city has a history. The result of Capt. Eads's work in building the South Pass jetties has not only demonstrated the soundness of the theory on which he has acted, but has already secured an open channel to the Gulf of Mexico more than twenty feet in depth and two hundred feet in width. This gives to the distinguished projector of this great national work his first payment of half a million, and the work still goes on, deepening and widening the channel from day to day. Its complete consummation, with a permanent channel of thirty feet, will be worth untold millions to the West and to the whole world.

CONCLUSION.

And now, not to weary you, let me say that, while we lack many of the material requirements of an efficient scientific body, we have a rich and boundless field for observation before us. It has been frequently remarked in Europe that the scientific work of institutions is, in intrinsic value, in inverse ratio to the magnitude of their buildings, or elegance and costliness of their Memoirs. Let us take courage from this experience, and remember that our present inability to build up the more outward evidences of labor does not neccessarily preclude real investigation.

Unfortunately, such outward signs, together with immediate usefulness, are more apt to invoke popular favor and support than the quiet pursuit of science for truth's sake. The brilliant discoveries of a Morse, a Fulton, a Stephenson, a Faraday, which invoke universal admiration, are the exception, and few men not engaged in the work of science appreciate what she is accomplishing for the amelioration of the race; and our business men, engrossed with their daily commercial pursuits, and frequently duped by scientific charlatans, are too apt to consider scientific men visionary and impractical. Did they pay more deference to science—did they more liberally encourage scientific work,—they would suffer less from such pretenders. Only those who have made some progress in knowledge become aware of how little they know, and are able to discriminate between the bogus and the real; and the failure to thus discriminate has been productive of more loss to our commerce, and our industries generally, than would have liberally endowed all the scientific institutions in the land.

As Dr. Draper, in his late address before the Chemical Society, well remarks:—"There are among us some persons who deprecate science merely through illiterate arrogance; there are some who, incited by superficiality, * * * dislike it; there are some who hate because they fear it, and many because they find it in conflict with their interests. * * * Let us not return railing for railing; but, above all, let us deliver unflinchingly to others the truths that Nature has delivered to us." Let us, I may add, as members of the Academy, endeavor to teach that, while man is the interpreter of Nature, science is its right interpretation. Let us, in entering this, the twenty-first year of our Academy's existence—this second centenary of our republic, so darkened by political complications—determine to do all we can for the advancement of science, which is the great power of the age.

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